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ABSTRACT

This study is concerned with how much children remember about a salient event in their life, how much is forgotten over time, and whether age at the time of the event affects how much is remembered. Thirty-six children (ages 4, 8, and 12) and 26 college students, all of whom had a sibling born when they were age 4, were either interviewed or given a questionnaire concerning events when the sibling was born. Twenty specific questions were asked about events in the child's life just prior to, during and following the mother's stay in the hospital. The same questions were given to the mothers of the 36 children (to confirm or disconfirm the children's answers) and to 20 additional college students who were at various ages when siblings were born. Age at the time of recall had no effect on recall of specific information by children and comparable college students, or on children's confirmed scores. Several possible explanations for this finding are explored. Children's disconfirmed scores decreased between the ages 8 to 12. Mothers, unlike children, showed forgetting over time. Age at the time of the event was strongly related to recall of specific information for college students whose siblings were born at a range of ages. Further analysis suggested that age at the time of the event, and not elapsed time, is the critical variable in affecting how much children and college students remember about a sibling birth. (Author/SS)

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Memory for a Salient Childhood Event

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Abstract

Thirty-six children (ages 4, 8, and 12) and 26 college students, all of whom had a sibling born when they were four, were asked 20 questions requiring recall of personal events when a sibling was born. Children's mothers answered the same questions, as did 20 additional college students who had siblings born at a range of ages. Children's answers were confirmed or disconfirmed based on mother's reports. Age had no effect on total scores of children and comparable students, or on children's confirmed scores. Children's disconfirmed scores decreased between the ages of 8 to 12. College students' scores were strongly related to age at the time of the event. Mothers, unlike children, showed forgetting over time. Elapsed time does not seem to effect how much children and college students remember about a sibling birth, while age at the time of the event is important.

Memory for a Salient Childhood Event

This study is concerned with how much children remember about a salient event in their life, how much is forgotten over time, and whether age at the time of the event affects how much is remembered. The study of natural memory--memory for what people experience or learn in the course of their life--has just begun (Robinson, 1976; Rubin, 1977; Warrington, & Sanders, 1971). Of particular interest are two recent studies (Bahrick, Bahrick, & Wittlinger, 1975; Brown, & Kulick, 1977) which found little or no forgetting for certain autobiographical information over a period of years.

Brown and Kulick (1977) asked adults about events in their lives at the time of the assassination of President Kennedy. Because subjects were able to report precisely what they were doing when they heard the news, the authors suggested that events which are surprising, consequential, and emotionally arousing give rise to permanent "flashbulb" memories. Bahrick, Bahrick, & Wittlinger (1975) tested recall and recognition of the names and faces of high school classmates, varying the retention interval since graduation from two weeks to 57 years. They found virtually no decrement in recognition of pictures and names of classmates, nor in accurate pairing of names and faces of classmates, up to 35 years after graduation.

These studies represent a shift in paradigm toward more ecologically valid studies of memory (Neisser, Note 1; Gibbs, 1979). They support the view that natural memory is worthy of investigation, since the results differ from those of laboratory studies. Although no parallel studies have yet been done with children, it would seem particularly important to do so, since young children do poorly compared to older children on many memory tasks (Brown, 1975a). Systematically asking them about past events in their lives might shed new light

on what children can remember.

At least three methodological issues must be dealt with in order to study children's natural memories. The first problem concerns the event to be recalled. While there are many shared experiences one can ask adults about, such as child-rearing practices (Robbins, 1963) or newsworthy events (Warrington, & Sanders, 1971), it is not obvious what one could ask large numbers of children about. We chose the birth of a sibling as an event which would be both common and salient enough for many children to remember.

Second, it is difficult to assess the accuracy of retrospective reports. In the present study, we assessed accuracy by independently asking mothers and children the same questions. It was assumed that questions relating to a birth would elicit high recall from mothers.

Third, it is difficult to measure children's recall independently of their narrative skills, which improve dramatically with age. Subjects in studies of natural memory typically are asked to indicate everything they remember up to their eighth birthday (Waldfoegel, 1948), or to think of a personal experience which particular words remind them of (Robinson, 1976). Young children, who have difficulty constructing a coherent report of sequential events (Brown, 1975b), would not be expected to answer these questions appropriately. We minimized this problem by asking specific questions which could be answered in a few words (e.g., "Who took care of you while your mother was in the hospital?"). Questions were asked in chronological order.

In the current study four year old children were interviewed about a sibling birth which occurred within a year of the interview. Eight year olds, twelve year olds, and college students were asked about sibling births which had occurred when they were four. Thus, retention could be assessed shortly

after the event, and at various intervals up to 16 years. Effect of age when the birth occurred was investigated by asking college students about sibling births which took place when they were from one to 17 years old.

Method

Subjects

Children and mothers. Six boys and six girls in each of three age groups (Mean ages: 4-6, 8-3, 12-4), all of whom had had a sibling born when they were 3-6 to 4-11 years old, were interviewed. Mean ages at the time of sibling birth were 3-11, 4-3 and 4-2 for the three age groups, respectively. The youngest group was tested one to 12 months after the event, the average interval being 7 months. The mothers filled out questionnaires about the same events. Our subjects were middle class families in suburban Boston, and were obtained through newspaper advertisements and information provided by schools and participants.

In advance of the interview, families were told that the study concerned children's memory for some past events in their lives. Of those families asked directly to participate by the researchers, only one refused. Many willing volunteers did not meet the subject age/sibling age requirements. Families were paid \$3.50 for their participation.

College students. Eight female college students (Mean age 20-4), all of whom had had a sibling born when they were 3-6 to 4-11, were interviewed. Mean age at the time of sibling birth was 4-0. Their mothers were mailed questionnaires to return. Thirty-eight other female college students (Mean age 20-7), all of whom had had at least one sibling born when they were three or older, filled out questionnaires about the same events. All college students were fulfilling a course requirement in introductory psychology and

were not paid. In total, these students completed questionnaires on 73 sibling births which occurred when they were 1-3 to 17-5 years old. Four additional questionnaires were eliminated because of unusual circumstances, such as home births.

Materials

The interview schedule and questionnaire consisted of 37 questions about the events in the child's life just prior to the mother's leaving for the hospital, when the mother was in the hospital, and when the mother and infant returned from the hospital. All subjects were asked the same questions in the same order, with probes following specified questions. For each section of the interview, subjects were asked one introductory question (e.g., "In general, what can you recall about your mother's leaving to go to the hospital?"), followed by specific questions (e.g., "Who told you that she was leaving for the hospital?") which could be adequately answered in a few words. Answers were written down by the interviewer and recorded on a Sony Superscope tape recorder.

Procedure

When children and their mothers arrived at the laboratory, the purpose of the interview was explained, and the names and ages of all children in the family were obtained. Then the child was interviewed in one room, while the mother filled out the questionnaire in another. After the interview, which lasted about 15 minutes, the child played while the interviewer asked the mother about inconsistencies between her report and that of her child and wrote down the mother's answers.

College students who were interviewed followed the same procedure. Students who filled out the questionnaire did so in a classroom in small groups,

supervised by a student assistant. They first listed all of their siblings, then indicated whether they remembered a great deal, a little or nothing about the birth of each sibling, then filled out questionnaires for each sibling birth about which they remembered anything. They were asked to indicate on the questionnaire those answers which were guesses or information they were told by someone else. Questionnaires were filled out anonymously.

Scoring

Twenty specific questions were scored to assess the relative amount of information recalled (See Table 1). Questions not scored were introductory questions, questions about feelings, and questions about rehearsal.

Insert Table 1 about here

A set of criteria was devised against which to measure the adequacy of each answer. For example, in response to the question, "What presents did the baby get?" subjects had to say something more specific than simply "toys" or "clothes." Credit was given for answers provided anywhere in the interview or questionnaire, even if not in response to the particular question being scored. No credit was given if an answer was not specific enough, or if no answer was given. Thus, each subject received a total recall score, out of a possible 20, indicating the number of questions answered. In addition, children's answers were compared with their mothers'. Answers which corresponded with those of the mother, or which the mother deemed plausible, were "confirmed," while those which contradicted those of the mother, or which the mother deemed implausible, were "disconfirmed." Because only two of the mothers of the interviewed college students returned their questionnaires, we were unable to assess the accuracy of reports for college students, as

originally planned. All protocols were scored by a coder who was blind to the purposes of the study, as well as by one of the researchers. Interrater reliability was .96. Disagreements were resolved by discussion.

Results and Discussion

Effect of Time Since the Event

Mean total recall scores are shown in Table 2 for the three groups of children and a comparable group of college students. This group included

Insert Table 2 about here

all college students who reported on one birth which occurred when they were 3-6 to 4-11 (Mean age at sibling birth, 4-2). Twenty-six college students met this criterion, the eight who were interviewed and eighteen of the subjects who filled out questionnaires. [Since the scores of the two groups did not differ significantly from each other ($p > .10$), the data were combined.] An analysis of variance for unequal n 's (Winer, 1971) on scores of all four age groups yielded no significant effect of age on the total amount recalled, $F(3,58) < 1$.

The average number of responses which were confirmed or disconfirmed by mothers appears in Table 2 for the three groups of children. Analysis of variance indicated no effect of age on confirmed scores, $F(2,33) < 1$. There was a significant effect of age, however, on disconfirmed scores, $F(2,33) = 3.33$, $p < .05$, twelve year olds having fewer disconfirmed scores than the younger groups. While the results for total and confirmed scores suggest that no forgetting occurred over the course of 16 years, there may be other explanations for these results.

The lack of age differences in confirmed scores might be explained by the fact that mothers are more likely to agree with reports of their older children. Older children might have remembered less accurately than younger, but have obtained equivalent scores due to the mothers' willingness to deem their answers plausible.

In order to explore this possibility, all confirmed answers were placed in one of three categories. If mother and child independently agreed, the answer was coded as an agreement. If mother and child gave different answers which were not mutually exclusive, and the mother later deemed the child's answer correct or plausible, it was coded as a resolved difference. [For example, a child reported that when the baby was born he received a red rabbit doll, while the mother reported he received a book, and the mother later confirmed that he also received a red rabbit doll.] If mother and child gave different answers which were mutually exclusive, and the mother later deemed the child's answer correct or plausible, it was coded as a resolved contradiction. [For example, a child reported receiving no gifts when the baby was born, while the mother reported she received a piggy bank, and the mother later said it's possible she didn't receive any gifts then.] A greater number of resolved differences and resolved contradictions for older than younger children would support the hypothesis that mothers were more likely to confirm older children's answers.

The mean number of agreements, resolved differences, and resolved contradictions are presented in Table 3. For none of the categories was there an

Insert Table 3 about here

effect of age on scores, $F < 1$ in all cases. Thus it seems unlikely that mothers' confirmation of older children's answers was responsible for the lack of age differences.

Another possible reason for the apparent lack of forgetting was that the accurate memory of the younger subjects was replaced by good guessing for the older subjects. Since subjects did not consistently conform to our instructions to indicate which answers were guesses, we looked for other linguistic indications of guessing and uncertainty. A list of words and phrases was constructed which indicated that a remark was qualified (e.g., "probably," "I'm not sure," "possibly"). Because four year olds do not have the linguistic and cognitive skills to use qualified language (Miscione, Marvin, O'Brien, & Greenberg, 1978), we did not expect them to express uncertainty often. We assumed, however, that the eight year olds, twelve year olds and college students were equivalently well equipped to qualify their answers, and that an increase in guessing from age eight to twenty would constitute some support for the hypothesis.

A coder, blind to our hypotheses about qualified answers, judged which answers, of those which had been given credit, were qualified (interrater reliability, 100%). The mean number of qualified answers in the four age groups, from youngest to oldest, was 1.5, 4.42, 5.58, and 3.08 (4.13 for college students who were interviewed, and 2.61 for students who filled out questionnaires). Four year olds, as expected, used few qualified remarks. Results for the three older groups are similar, if scores from the interviewed college students are considered.

An analysis of variance for the three younger groups, as well as the interviewed college students, revealed a significant age effect, $F(3,40) = 8.20$,

$p < .001$, attributable only to differences between the four year olds and the three older groups (Duncan's new multiple range test, $p < .01$). When college students who filled out questionnaires were included in the analysis, results were again significant, $F(3,58) = 8.32$, $p < .001$, but scores for college students were indistinguishable from those of the four year olds, and differed from those of the eight and twelve year olds ($p < .01$). It seems that the questionnaire elicited a different style of response than did the interview. In neither case, however, was there an increase in qualified remarks after the age of eight. It would appear, then, that the lack of forgetting between the ages of eight and twenty cannot easily be explained by an increase in guessing. The increase in qualified answers from four to eight is probably better explained by the acquisition of the language and thought of qualification than by an increase in actual guessing.

A final hypothesis to explain the apparent lack of forgetting for this childhood event was that the research instrument itself was too insensitive to detect forgetting. The findings for the mothers make this hypothesis unlikely.

In general, mothers' scores were high, approaching ceiling for the mothers of four year olds (See Table 2). An analysis of variance on mother's scores was reliable, $F(2,33) = 3.90$, $p < .05$, indicating a decrement over time, with significant differences between the mothers of fours and mothers of twelves, $p < .05$ (Duncan's new multiple range test). Clearly the research instrument was sensitive enough to reveal forgetting, in spite of a ceiling effect which might have obscured the differences.

Effect of Age When Event Occurred

College students' total memory scores were correlated with age (in months)

when the birth occurred. The correlation was highly reliable, r (81 pairs) = .59, $p < .001$. To test whether the relationship between age and scores was due to age at the time of the event or elapsed time, the scores of those students who had had siblings born when they were approximately four were correlated with elapsed time. The lack of such a correlation, r (26 pairs) = .02, supports the notion that age at the time of the event is the critical variable.

Indeed, the age of three would appear to be the youngest age at which anything can be reported about a sibling birth (See Figure 1). Only three of

Insert Figure 1 about here

the 22 births reported when college students were younger than three had scores above zero. For two of these, the subjects were in the last quarter of their second year. The third, a student who was 18 months old at the time, indicated that she had been told, rather than remembered, much of the information she reported. By four years old, however, subjects reported a substantial amount about a sibling birth. For only 4 out of 39 births reported from the ages of four to 17 did students indicate they remembered nothing.

General Discussion

The results of this study provided answers to the three questions initially posed. First, how much can young children remember about a real-life event? Four year olds can remember an impressive amount about the birth of a sibling. They could answer a mean of 13 questions out of 20, 9 of which were accurate. For example, eight months after the event, one typical subject was able to report accurately what she was doing when she found out her mother had to leave,

who stayed with her, whether she visited or spoke with her mother in the hospital, who brought mother home, what time of day they arrived, what the baby was wearing, and what presents she and the baby received. We would suggest, then, that in no absolute sense are four year olds poor rememberers. It is important to ask now about other kinds of events and to determine the critical differences between memory in natural situations and in laboratory tasks.

Second, is information about a salient childhood event forgotten? Apparently it is not, for sixteen years after the event occurred. This finding, while different from what is generally found in the laboratory, is consistent with the findings of Brown and Kulick (1977) and Bahrick, Bahrick, and Wittlinger (1975) for adults.

The question of why this information is not forgotten is one which deserves further investigation. While rehearsal is the explanation usually put forth to explain long-term memory (Brown, & Kulick, 1977; White, & Pillemer, 1979), our questions about rehearsal did not produce clear results. Subjects were asked three general questions about rehearsal, and were given credit for rehearsal if they answered any of them positively. The point biserial correlation of reported rehearsal with memory scores was not significant, $r = .22$. We suspect that different results might have been obtained had we asked about rehearsal for each item, rather than about rehearsal in general.

Third, is age at the time of the event related to how much is remembered? The positive association of age and memory scores is consistent with developmental theory. The results of this study support the view that the impact of development is on initial encoding--that is, on the amount of information initially taken in--rather than on later transformations of the information. The only detectable effect of development after initial encoding was that the

disconfirmed answers decreased at age twelve. We assume this reflects the twelve year olds' increasing knowledge of the world, which permits them to inhibit answers which are unreasonable. For example, while a four year old might say that her mother spent a month in the hospital when her sibling was born, a twelve year old would know that such an answer would be unreasonable.

That virtually no births were reportable by subjects who were younger than three raises an old theoretical question about the meaning of childhood amnesia. Our data point to the period between three and four as being critical for the ability to remember a sibling birth. We suggest that two developments may be necessary for a child to be capable of the type of long-term memory tested here. First, that the child has mastered the language sufficiently to rehearse the event. Second, that the child must have developed schemes or scripts for normal routines against which to contrast the unusual. It may be that in the year from three to four children develop well-organized schemes for their daily routines (Nelson, & Gruendel, Note 2). Only then do events become memorable.

Finally, it is important to consider why the mothers showed forgetting, while the children did not. Recall that mothers were reporting on at least their second birth experience, while the children were reporting on the first one they could remember (and, for most, the only birth following their own in the family). Interference over time might therefore account for the forgetting of the mothers.

Alternately, the event may have been more memorable for the child than for the mothers--more like the flashbulb memories Brown and Kulick (1977) investigated. Surprise and consequentiality are two important correlates of flashbulb memories. While it would be difficult to argue that a sibling birth

is more consequential to children than to their mothers, it would not be difficult to argue that the events surrounding the birth are more novel and surprising to four year olds. Whatever parents do to prepare four year olds for the new infant it would seem far beyond their cognitive capacities to imagine what it is like to live with an infant, and to share that infant with their parents. Along these lines, while all of the mothers in our sample recalled having told their children about their pregnancy, fully 26 of the children did not remember having been told.

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Table 1

Interview Questions Scored for Recall

1. Who told you that your mother was leaving to go to the hospital?
2. What were you doing when you were told that she was leaving?
3. What time of day was it when she left to go to the hospital?
4. Who went with her? Did you go?
5. Who took care of you right after your mother left to go to the hospital?
6. What did you do right after your mother left?
7. How did you find out that the baby was a boy or girl?
8. Who took care of you while your mother was in the hospital?
9. What things did you do with that person while your mother was in the hospital?
10. Did you visit your mother while she was in the hospital?
11. Did you talk to your mother on the telephone while she was in the hospital?
12. How long did she stay in the hospital?
13. Who picked your mother and the baby up?
14. What day of the week did they come home?
15. What time of day was it?
16. What did you do when your mother and the baby arrived at home?
17. What was the baby wearing when you first saw it?
18. What presents did the baby get?
19. Did you get any presents at that time?
20. How did you find out that your mother was going to have a baby?

Table 2

Mean Memory Scores for Children, College Students, and Mothers

Subjects	N	Total Recall		Confirmed Recall		Disconfirmed Recall	
		Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)
4 year olds	12	13.58	(3.65)	9.25	(2.99)	4.33	(1.37)
8 year olds	12	13.58	(4.48)	9.25	(4.59)	4.33	(1.97)
12 year olds	12	11.83	(3.10)	9.00	(3.28)	2.83	(1.53)
College students	26	10.58	(5.15)				
Mothers of 4's	12	18.92	(1.24)				
Mothers of 8's	12	18.33	(1.56)				
Mothers of 12's	12	16.83	(2.59)				

Note. Maximum score = 20

Table 3

Mean Number of Children's Answers Confirmed by Agreement,
Resolved Difference, or Resolved Contradiction
With Mother at Each Age

Age	Agreements	Resolved Differences	Resolved Contradictions	Total Confirmed
4	6.92	1.92	.41	9.25
8	6.00	2.42	.83	9.25
12	6.42	2.00	.58	9.00

Figure Caption

Figure 1. Recall scores as a function of age for sibling births reported by college students. (Numbers indicate frequencies at each point.)

